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Recognizing readiness in manufacturing firms

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This article presents a framework for manufacturers to assess their readiness for taking a service design approach to the development of product-service systems (PSS). The framework is developed from the results of interviews with three manufacturing firms that have begun the servitization journey. The selected companies have traditionally been involved in goods production, and have recently started engaging with services in different ways. The readiness framework attempts to bridge the previous studies and models offering companies a self-assessment tool based on the service implementation readiness measured along nine dimensions that apply to manufacturing firms to adopt a more customer-centric approach that fits into their company and suits their needs.

keywords: design for strategy; service design; servitization

Introduction

Over the last few decades companies have faced radical changes in the way people connect, think and work together (Pine & Gilmore, 2000, 2011). We are now in the fourth Industrial revolution (Schwab, 2016), characterized by increasing blurring of the boundaries between commodities, goods, services, experiences and transformations. Dov (2014) notes that we have shifted from a knowledge economy to human economy. It appears that as customers and stakeholders develop a more sophisticated understanding of service, they seek more satisfying experiences and transformations from their interactions with both tangible and intangible products. In this context, the shift from products to services or the development of product-service systems (PSS) requires manufacturers to more effectively define what they sell. Rifkin (2001) proposed that in such a scenario, many things are no longer privately owned, but rather that users pay for access to services and experiences. In response to this evolving industrial context, to be competitive, manufacturers are encouraged to examine the value chain and move further towards the customer (Wise & Baumgartner, 1999). In response, designers have begun to expand their

offerings from object-based product design to experience-based product and service design (Kimbell, 2011; Morelli, 2009b; Secomandi & Snelders, 2011; Wetter Edman, 2009). The research described in this article is concerned with how Service Design might be an appropriate route to servitisation where companies are interested in developing improved value for their customers. Rethinking value for the customer motivates manufacturers to find their value in the supply chain. In order to evaluate the opportunity to control the channel to the customer, a company can assess their readiness and willingness to deploy a product-service system as an interface between the firm and the customer. At the lowest level, an integrated solution can be developed based on customers' need within the boundaries of the company's vision. Considering a service design approach, a company might then create a new PSS drawing on the existing company's capabilities. Taking a wider view, the company might begin to explore the potential for addressing customer value through a new configuration of products and services developed jointly with other partners in its supply chain. The need to develop a readiness framework for smaller manufacturing firms stems from the recognition of SMEs as the engine of the national economy (BIS, 2013). The servitization process within manufacturing has a huge impact on the way companies innovate and operate to remain competitive; there has been lots of academic interest on firms' capabilities and internal assets (Eisenhardt & Martin, 2000; D. Teece & Pisano, 1994; D. J. Teece, 2007; Ulaga & Reinartz, 2011) but little exploration into this size of companies in relation to services.

Background

This paper deals with small to medium sized (SMEs) manufacturing firms involved in the servitization process. It is focussed on how service design might support them in developing in-house capabilities to implement product-service systems (PSS) and offer integrated products and services (Benedettini, Clegg, Kafouros, & Neely, 2009; Simons, 2013). The literature provides many examples on how large organizations have shifted from good-based production to service-based provision (Saara Brax, 2005; Mathieu, 2001a; Oliva & Kallenberg, 2003). Drivers and barriers related to this phenomenon and the types of value propositions based on the integration of product and service is also discussed (Baines et al., 2007; Tukker, 2013; Vargo & Lusch, 2004b). However there has been little exploration of manufacturing SMEs from a service design perspective (Iriarte, Justel, Orobengoa, Val, & Gonzalez, 2014; Sangiorgi et al., 2012) despite this class of company representing the largest section of the economy (BIS, 2013). Gebauer, Gustafsson, and Witell (2011) argue that in the current marketplace competitive advantage can be gained by those firms that begin to offer a service component to their customers; this shift encourages companies to adopt a Service-Dominant Logic for the creation of value propositions to customers (Vargo & Lusch, 2004a). However, Service Dominant Logic requires much more than an increased emphasis on services since it implies a reframing of the firms' purpose and its role in value co-creation (Kowalkowski, 2010). The body of knowledge examined explores three facets of this topic, as follows:

- Manufacturers vs. Service providers - The design process and the manufacturing legacy

- The transition from products to services in manufacturing companies: drivers and barriers
- Recognising heterogeneity in SMEs

Manufacturers vs. Service Providers - The design process and the manufacturing legacy

In the extant literature, new product development and new service development are discussed separately. Further, the level of description of PSS development processes is less detailed than the previous two. In both cases, the very first phases of the development process, the so-called 'fuzzy front-end', are difficult to codify (Clatworthy, 2013; Reid & De Brentani, 2004). Kimbell (2009) investigated the differences between new product development and service design and found that service designers pay attention both at macro (service experience) and micro (touchpoints) level. The literature raises a number of questions on how to frame PSS; how product and service components relate to each in the development process and the related skills and capabilities needed at each stage. Companies have been stimulated to start designing services with the same attention as products (Polaine, Løvlie, & Reason, 2013); however, this does not imply that the process is the same. Manufacturing firms that are encouraged to go downstream (Wise & Baumgartner, 1999) have to start facing customers from the very front-end of the development process (Walters, Thurston, & Cawood, 2012). PSS is generally concerned with moving towards offering greater integration with services (going downstream), moving towards offering greater integration with products (going upstream) (Baines & Lightfoot, 2013a). But manufacturers have to deal with a constant tension between integration and separation of offering, people competences, firms, suppliers and competitors (Voigt, 2016).

The transition from products to services in manufacturing companies: drivers and barriers

Manufacturing firms face major challenges when they start the transition from a purely product-based offering to solution-based offerings. Shifting from goods-logic to service-logic requires deep understanding of customers to create value propositions based on a relationship (Michel, Vargo, & Lusch, 2008). Numerous authors assert that positive results can come from offering services (Saara Brax, 2005; Gebauer, Fleisch, & Friedli, 2005); companies that adopt a service-based approach gain more competitive advantage because services are more difficult to imitate due to the higher specialization; and they provide long-term relationships with users (Oliva & Kallenberg, 2003). But a move into services is not a panacea and improvements in profits are not automatic (Baines & Lightfoot, 2013a). Certainly, manufacturing companies possess knowledge and the expertise about their products; but deeper knowledge about internal assets and resources is needed for the additional development of services (Kowalkowski, Witell, & Gustafsson, 2013). However, there is limited availability of formalized service design or PSS processes that are useful to manufacturers in making the transition to additional service development. In this paper, the authors adopted the definition of PSS by Mont and Tukker (2006) as this concept suggests the need to link hard and soft issues such as technology and sociology, products and services, and to view existing environmental problems from a systemic perspective. Tukker (2004) categorises three types of PSS: product-oriented, use-oriented and result-oriented. Whereas services in the PSS field are usually presented as: basics, intermediate and advanced services (Baines & Lightfoot, 2013a, 2013b).

From a design perspective, Morelli (2003) borrowed a set of criteria previously proposed by Bijker, Pinch, and Hughes (1989) to describe the technological frame applied to PSS. The new operative paradigm suggested by Morelli (2009a) looks at the social and human components of the service as services are social constructions; thus, customers should be an active part of the value co-production process. Mathieu (2001b) presents 'service manoeuvres' to indicate the typology of actions to take in manufacturing when moving to service offerings. Saara Brax (2005) stated that manufacturing businesses that approach services require a different organizational setting than goods, because an incremental approach to servitization is inadequate for anything other than the most basic of new service development. Gebauer et al. (2005) introduced seven behavioural processes in order to increase the service awareness; to accept the risks of extending the service business; and, to believe in the economic potential of services. Recent studies on servitization show that for large manufacturing companies it is useful to break down the barriers for novel collaborations and to consider value at the centre; to develop a conscious and parallel evolution of the understanding of service, design and users within these firms (Sangiorgi et al., 2012; Sangiorgi, Lee, Sayar, Allen, & Frank, 2016). Within manufacturing firms to undertake transition, design professionals are suggested to cover a broader role as strategic partners in the entire servitization transition and in overcoming the key challenges to its effective implementation (Calabretta, De Lille, Beck, & Tanghe, 2016). For companies to understand alternative offerings in PSS, Kim (2016) introduces a framework to classify PSS according to the process and it comprises value, product, service, product-service ratio, customer, business model, actor, touchpoint, context, time, society, and environment. There is much rhetoric amongst the design community on how design provides practical solutions to complex industrial problems; therefore, it is timely to begin to investigate how design, specifically service design, might play the role of the interface between theory and practice in the implementation of PSS in SMEs.

Recognising heterogeneity in SMEs

Barney (1991) as cited in Ulaga and Reinartz (2011) points out the concept of uniqueness of the firm's portfolio of resources and capabilities. That small companies differ from large companies is often highlighted in literature considering industrial activity. However, the heterogeneity of small companies is less often emphasised. In research that aims to create useful output for SMEs, it is worth noting that best practices, skillsets and assets differ from one company to another. The purpose of this research is to help smaller manufacturing companies to start thinking from an inside-out to an outside-in perspective. Welsh and White (1981) asserted that SMEs are not 'miniature versions' of large firms. SMEs are regularly recognised as the engine of national economies. However, they are precluded from accessing or effectively utilising service design, as they have neither the resources to engage external consultants nor the knowledge to develop in-house capability. Berends, Jelinek, Reymen, and Stultiëns (2014) state that prior studies found that small firms do not deploy the formalized processes identified as best practice for the management of new product development (NPD) in large firms. The review of the literature highlighted a number of gaps regarding a design approach to servitisation in SMEs, including:

- A lack of studies on servitization on SMEs;

- A lack of case studies that applied a User Centred Design (UCD) approach and Service Design thinking;
- And, minimal guidance on the transition from established practices/routines to new ones in SMEs.

Thus, this paper will explore the conditions that affect companies' readiness to implement services. Further, the paper documents to development of guidance for such manufacturers on how to re-configure their development processes to address the challenges, and explore the questions:

- What is the willingness and capability of manufacturing SMEs for the development of services?
- Can SMEs get a positive outcome from deploying service design thinking?
- How can SMEs recognise their readiness for service design approaches?
- How might they be guided in service design implementation?

Servitization is more that the creation and development of services as adds-on to existing offerings. It requires organisational change for manufacturers willing to start the servitisation journey. Manufacturing firms have to subordinate previous knowledge and practices on making products (Junginger, 2007, 2015) to as service as the interface between customers and firms (Heapy & Parker, 2006; Secomandi & Snelders, 2011). Thus, by answering these research questions, we aim to provide manufacturing firms an enabler tool to identify their assets and competences.

Methodology

Drawing from the literature, the servitization phenomenon comprises internal and external drivers and barriers influenced by the context the firm operates. The intent of this study is to fill the research gaps and address the research questions in investigating motivations of readiness in undertaking the servitization journey. This research is exploratory in nature and due to the lack of case studies on servitization of SMEs from service design, a qualitative approach with a longitudinal analysis of three manufacturing companies was taken to allow an in-depth investigation of the topic. Previous research (Saara Brax, 2005; Gebauer, Paiola, & Edvardsson, 2010; Kowalkowski, 2011; Mathieu, 2001a; Oliva & Kallenberg, 2003) tends to prefer a qualitative approach to investigate the servitisation phenomenon. The review of the literature offers interpretations of servitisation that are filtered from the information that the researcher can access based on his or her point of access in the field (Saara Brax & Visintin, 2016). Servitisation does not seem to be a predefined transition process for small manufacturing companies, therefore if "*any way goes*" (Kowalkowski et al., 2013), this suggests that there is no unique and objective reality, but the inquiry is built through people's experience. Considering reality as socially constructed (Blaikie, 2000), to uncover and explain the servitization issues, it is crucial to understand how owners and employees of the selected firms interpret what surrounds them, their values and priorities, their hands-on tasks and what they focus on day-by-day activities. This qualitative research is intended to discover new themes and new explanations to describe the implications of servitization in relational, organisational and social terms. Qualitative data are generated by the social context and taking this interpretivist position the methods of analysis produce rich, nuanced and detailed data (Mason, 2002). To situate the role of the authors of this research, valuing the personal interaction with respondents, the authors within the philosophical domain of interpretivism, have taken an integrative inductive and abductive research

approach (Saunders, Lewis, & Thornhill, 2012). In induction, to better understand the nature of the problem and making sense of the interview data, the analysis would result into a formulation of a theory in the form of a conceptual framework. Induction asserts to generate theory following data, considering the relevant role of context and the advantage of having a small sample to study. Within the abductive research domain, data collection aims to explore a phenomenon, to identify themes and patterns, to locate these in a conceptual framework and test this through subsequent data collection. Hence, drawing from the background section, the questionnaire for the first introductory face-to-face semi-structured interview was created from six themes inductively emerged from the literature. The adoption of semi-structured interviews stems from the need of eliciting more information from respondents (McCracken, 1988). During the interviews, audio was recorded and transcribed. In the data analysis, an abductive approach was taken and it consisted in the triangulation of the results of the interviews with the extant literature. This phase resulted in the creation of a readiness framework based on semi-structured interviews. The application of the framework consisting of three questions along the nine dimensions identified as representative of the main facets of servitization. A total of twenty-seven questions (three per dimension) were formulated to be subsequently tested with the companies. Answers given were based on intensity, state of adoption and frequency of the activities and resulted in radar diagrams. Recommendations on the next steps in servitization journey were provided. Data collected in the second phase 'deepening understanding' were analysed and triangulated with the extant literature. In the last phase, results were shared and the opportunity to iteratively deploy the framework to track firms' evolution was illustrated to the companies. Similarly, in their extensive longitudinal study, Fischer, Gebauer, Gregory, Ren, and Fleisch (2010) took an interpretative multiple-case study approach organizing themes around the key dynamic capabilities from the literature and support them with research propositions.

Requirements & Case criteria

In this research, samples and cases were not randomly selected but information-oriented in order to reach a variation of cases (Denzin & Lincoln, 2011). In order to answer the research questions, the following set of criteria were used to select companies:

- Participating companies must be perceived as stable and have established procedures;
- They must have demonstrated some interest in growth through the development of services or use of service design;
- Geographically accessible and willing to entertain regular visits from the research team;
- The sample must include representatives of SMEs

Building on the exploratory nature of this study and the willingness to develop and in-depth investigation along a longitudinal study of manufacturing companies, there is no a priori distinction between experienced companies and companies that are considering embarking servitization. The engagement with the three companies occurred in a series of interviews with key informants of each firm at strategic and operational level as a way to validate internal alignment and coherence between the strategy plan and the operations plan.

Table 1 Companies overview

Company A	Company B	Company C
Energy efficient ventilation solutions	Electro-chemical water treatment	Special purpose machines and automations systems

Design research

Design research seems unusual in being understood both as an intellectual discipline as well as an applied discipline. Sato, K. (2004) as cited in (Fallman, 2008) notes that the interest of design research is twofold—in understanding the acts of design, and in understanding the subjects of design. Drawing from the abductive approach, the research design is shaped by the researcher as designer (Buchanan, 1992; Fallman, 2008). The research design is shaped by the researcher as designer (Buchanan, 1992; Fallman, 2008); and, taking a designerly way (Buchanan, 1992; Cross, 2001; Dorst, 2011; Fallman, 2008; Snelders, Van de Garde–Perik, & Secomandi, 2014) of doing research. Primary data were collected in three phases, namely: exploring; deepening understanding, and analysis and outcome.

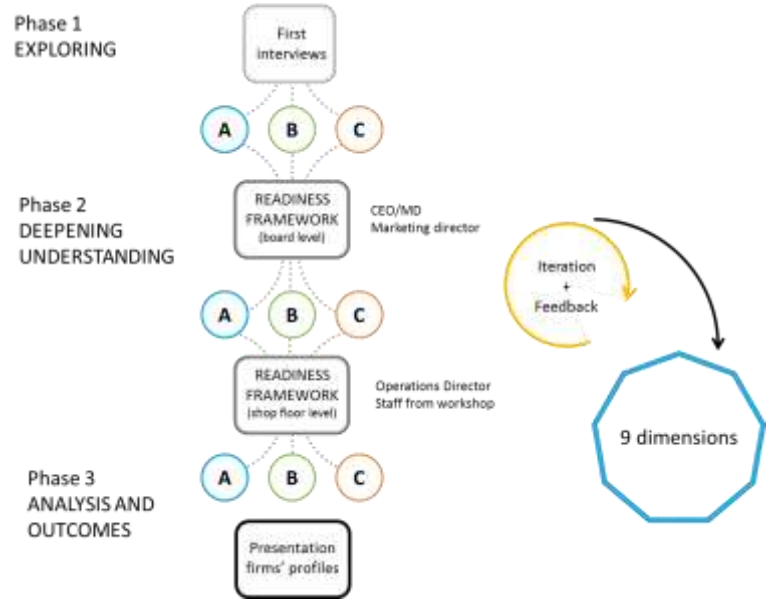


Figure 1 Research design phases: exploring; deepening understanding; and, analysis and outcomes

The table below show the engagement of the researchers with the three companies.

Table 2 Overview of the engagement with the companies

	Company	Role	Topic discussed	Length
Phase 1 Exploring	Company A	Marketing Director	Introduction Questionnaire	00:50:31
	Company B	Managing Director	Introduction	01:19:59

		Operations Director	Questionnaire	
	Company A	Marketing Director	Follow-up Questionnaire	01:02:13
	Company C	Managing Director	Introduction Questionnaire	01:31:56
Phase 2 Deepening Understanding	Company B	Managing Director (Operations Director)	Readiness Framework Strategic level	01:08:19
	Company A	Marketing Director	Readiness Framework Strategic level	01:29:02
	Company B	Workshop (2 employees)	Readiness Framework Operational level	01:22:46
	Company A	Operations Director	Readiness Framework Operational level	01:25:14
	Company C	Managing Director	Readiness Framework Strategic level	01:36:14
		Workshop supervisor	Readiness Framework Operational level	00:50:22
Phase 3 Analysis and Outcomes	Company A	Marketing Director Operations Director	Presenting the results	00:32:04
	Company C	Managing Director	Presenting the results	00:48:01
	Company B	Managing Director Operations Director	Presenting the results	00:58:49
	Total time spent with the companies 14:55:30			

In the first phase “Exploring”, face-to-face semi-structured interviews were set up, comprising of 18 questions grouped into six sections: general background information; the development process and people involved; the configuration of the offering; and, service perception. The questions focused on the internal activities and dynamics within the development team, how decisions were made and how integrated offerings were perceived and developed. The answers given in the first phase informed the first version of the readiness framework that was pilot tested with company A. This resulted in small modifications regarding the relevance of the topics discussed, and obtaining a feedback on this exercise. Although Company A is larger than Companies B and C, it offered valuable insights on the servitization. During the interviews, audio recordings were made and written notes were taken. In the data analysis phase, the diagram exploring barriers and drivers in servitization was scanned and coded and interviews were transcribed, coded and analysed using NVivo. The coding and analysis strategy of data collected was not based on the frequency of topics from the respondents but on firms’ emphasis put on the issues discussed during the interviews. Therefore, Nvivo was used as a systematic tool to qualitatively categorize topics concerned with raising awareness of servitization. This facilitated categorisation and the creation of a systematic cloud/list of emergent keywords, topics and issues. The readiness framework was

developed in an ongoing iterative process between interviews and literature. In the second phase “Deepening understanding”, the readiness framework was tested both at board level and at a shop-floor level. The framework consisted of semi-structured interviews with 27 questions (three questions for each of the nine dimensions) along three probes: frequency, state of adoption and intensity. In the third phase “Analysis and outcomes” company profiles were created and presented to add further validation on the framework. In terms of research methods, although case study is largely used in servitization literature, in this research the authors prefer to adopt the label of design cases to distinguish them from case study. Case study are described in terms of investigation of current phenomenon within real-life contexts, to generate answers to why, how and what questions , to build evidence on multiple sources (Yin, 2009, 2013). While the focus of case study is to develop an in-depth description and analysis of a case or multiple cases (Creswell, 2013), design cases aim to generate an output for the designerly way as a way of doing building on the twofold definition of design as process and outcome (Fallman, 2008).

The Readiness Framework

The framework assesses the prerequisites for manufacturing SMEs to make the transition from product-only offering to product-service continuum offering. It is intended to assist companies in recognising the opportunities for undertaking a servitization journey; to frame the challenges at the organisational level; to notice alignments between strategic and operational levels; and, to provide guidance on the dimensions to improve upon.

Developing the framework

The readiness framework is based on two leverages of service design: being and making. The first one comprises the meta-design skills associated with SMEs; while the second relies on the operational tasks needed to implement the value proposition whose product and service ratio depends on the first leverage. The user-centred service innovation perspective (Walters et al., 2012) instils a human perspective in the organisation and recognises individuals’ skillset and enables people to accomplish their goals.

As a result of the first set of interview, preliminary results based on the managers’ perspective were grouped as follows:

- Identity and legacy on making (“Fabricating at a slow pace to stop and think”)
- Service awareness (“Manufacturing is not just making one thing in one place”)
- Service design making (“Service design is not only designing a new service”)

After the first interview, it became clearer that servitization is more than simply adding services but rather requires a deep understanding of the motivations and potential benefits. Bailey (2012) points out that design readiness is one of the factors to embed design within companies. The results implied the need for tools that could assist in organisational change in preparation for service development. The framework then developed from an investigation into what factors can influence such change and how might a company recognise what it needs to address.

Origins of the dimensions

In-depth analysis and coding of the interviews resulted in a number of recurring themes. This informed the creation of the readiness framework of 27 questions described by nine dimensions: effectiveness; experience; service history; external engagement; culture and development; creativity; risk propensity; communication; and, awareness.

Figure 2 The readiness framework with the nine dimensions

The nine dimensions drawn from the data collected have been triangulated to the body of knowledge of the literature. Table 1 below presents the nine dimensions to assess firms' readiness in servitization.

Table 3 The nine dimensions: description and references

#1 EFFECTIVENESS	What has your company made to become what it is today?	This dimension considers the past achievements as the foundations of the progress and growth of your company including the internal set of performance criteria.	Eisenhardt and Martin, 2000; O'Reilly III and Tushman, 2004; Baldwin, 2003; Teece, 2007; Löfberg, 2014
#2 EXPERIENCE	How would you define your offering in terms of breadth and depth?	This dimension considers the configuration of capabilities and the codification of new practice-based knowledge in the	Parasuraman et al., 1985; Teece and Pisano, 1994; Thomson and Koskinen, 2012;

		development team over the years.	Hafeez et al., 2002; Junginger, 2007
#3 SERVICE HISTORY	What is the nature of your offering?	This dimension considers the evolution of your offering from internal and external stimuli to anticipate or respond to customers' needs.	de Brentani, 1991; Davies, 2004; Kindström and Kowalkowski, 2009; Avlonitis et al., 2013; Paiola et al., 2013; Baines et al., 2013; Kowalkowski et al., 2013; Dotzel et al., 2013; Löfberg, 2014
#4 EXTERNAL ENGAGEMENT	How do you relate to the external world?	This dimension considers the way companies relate in supply chain and non-supply chain relationships; the role that actors play in the network and the co-creation opportunities.	Davies, 2004; Prahalad and Ramaswamy, 2004; NESTA, 2007; Payne et al., 2008; Verganti, 2009; Grönroos, 2011; Chesbrough, 2012; Kowalkowski et al., 2013
#5 CULTURE AND DEVELOPMENT	How does the learning process occur within the development team?	This dimension considers the existing staff capabilities and the learning mechanisms to expand them further.	Baldwin, 2003; Davies et al., 2006; Gebauer et al., 2010; Martinez et al., 2010; Acklin, 2013; Paiola et al., 2013
#6 CREATIVITY	How do you encourage and motivate your employees to	This dimension considers staff motivation; the way they explore and test new ideas; the rewards system and	Eisenhardt and Martin, 2000; Teece, 2007

	express their ideas?	the environment the development team is immersed in.	
#7 RISK PROPENSITY	How do you manage novelty and uncertainty?	This dimension considers your attitude towards difficulties you encounter to meet the requirements of your offering to enter the market.	Kahneman and Lovallo, 1993; Eisenhardt and Martin, 2000; Avlonitis et al., 2013
#8 COMMUNICATION	How do your employees access information within the development team?	This dimension considers the flow of information, the way it is exchanged within the development team to assist the decision-making process.	Normann and Ramirez, 1993; Payne et al., 2008
#9 AWARENESS	How do you consider solutions with both product and service components?	This dimension considers the recognition of services as a critical component of the value proposition for the customers to offer.	Chase, 1978; Parasuraman et al., 1985; Bitner, 1992; Normann and Ramirez, 1993; Morelli, 2003; Davies, 2004; Brown, 2009; Ates and Bititci, 2011; Bailey, 2012; Madden, 2013; Acklin, 2013; Avlonitis et al., 2013

The readiness framework enables different levels of understanding of how people with different roles in the same firm see themselves in the servitization along the dimensions. In order to have an overview of the company the effectiveness dimension starts out the conversation with the description of past achievements, successful products and/or services that made the firm what it has become today. All the lessons learnt inform the experience dimension that sets out how knowledge has been codified to create the current configuration of the offering expressed in the service history dimension. As the offering evolves, the external engagement of the firm adapts accordingly. The working and learning environment affected the way culture and development is managed; sources of innovation and independent

ways creativity takes place and, generally, the attitude towards novelty and the risk propensity related to change. Communication plays a role in circulating formal and informal information within the company that supports a shared vision of the future on raising awareness on the service value and the customer-oriented approach to instil in new value proposition.

Results - Deploying the framework

Building on an iterative process between the literature and the analysis of the results, the readiness framework is a self-assessment tool to identify and align competences and the implementation steps for manufacturers to take in a servitization journey. This section reports three case studies where the framework is applied presenting the results and the beginning to undertake the analysis of the framework in context. All the interviews lasted between an hour and an hour and a half. The board level answers are represented in radar diagrams that show the readiness from 1 to 5 for each dimension. The scoring system consists in a Likert scale where respondents were asked to answer according to intensity (very poor/ poor/ fair/ good/ very good), frequency (never/ occasionally/ sometimes/ often/ always) and state of adoption (not in use/ start planning/ planned/ start implementing/ implemented). Interviews with three manufacturing companies took place over 11 months. Staff from board level and operational level was involved in more than 14 hours interviews. Although the readiness framework has been developed as a self-assessment tool to be used by the companies to assess how ready they are to undertake servitization, the researchers completed the tool on behalf of the companies. Results were presented in a report and discussed with the three companies at the end of the study.

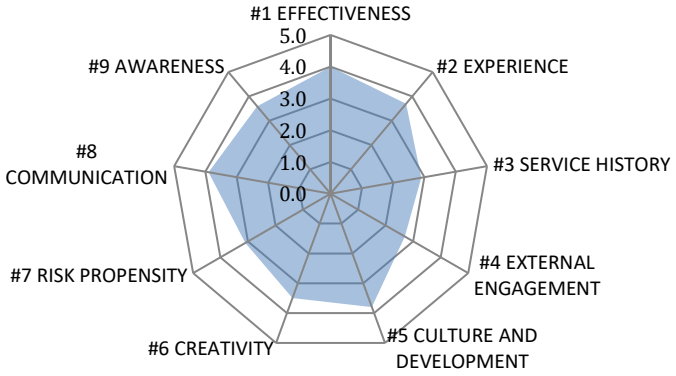
Case study Company A

Company A is a manufacturing company with over 460 employees that has been operating in the ventilation systems market for over 50 years. Between 2010-2013 it was involved in the Service Design Programme (a Welsh Government programme to help companies explore the development of services through service design). As a result of the project, they realized that training third party installers plays a key role in correct installation of their products, reduces frustrations of installers and, ultimately, better serves customers. They have a strong brand and sell a wide range of ventilation products from single fans for residential purposes to elaborate ventilation systems for commercial purposes. Currently no revenues is generated from selling services. Hidden services such as drawing and consulting are support product sales. Although service design tools are fully implemented in their development process activities, the marketing director showed uncertainty on the real need to see their products as services because the lack of immediate evident economic rewards.

The operations director’s perspective showed the key role of the operations department as an interface between the engineering department and the workshop. From the operations director, the service component, in terms of support network and assistance via reps’ performance and customers’ happiness, is more emphasised and on ongoing refinement.

Presented below are the results from of the readiness framework at strategic level. Generally the dimensions are high, except for service history and risk propensity where they scored low for the wide product offering and little propensity to develop services as a source of profit.

Figure 3 Radar diagram of Company A



Case study Company B

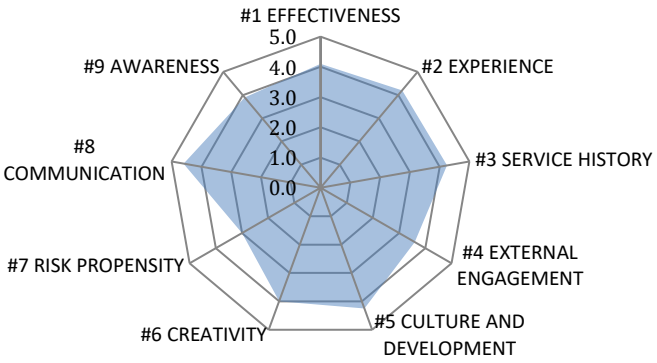
Company B is a family-owned business that operates in the electro-chemical water treatment with 10 employees. The CEO/Technical Director founded the company. It is an R&D focussed business, prototyping and testing the plants they design to address clients' enquires.

Between 2010-2013 company B was involved in the Welsh Government Service Design Programme. The engagement helped them to make the service element more explicit in their offering and create a better experience for their clients. With the advancement of technology, they introduced a remote control that enabled them to shift from selling plants to leasing them.

They are currently involved in a large project promoted by a local river authority that involved a network of stakeholders in the farming community to dry waste and treat water. They are working on how to extend the use of the plant once water is cleaned. Employees appear well motivated around the regular development and testing of new products for clients.

Below the results from the application of the readiness framework are presented. Compared to company A and C, company B performed higher scores as they have begun to implement services in their offering.

Figure 4 Radar diagram of Company B



Case study Company C

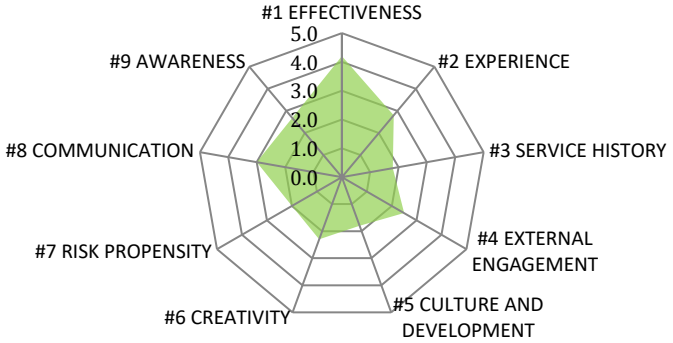
Company C is has 34 employees that has been producing special purpose machine and automation systems for over 20 years. There are no standard catalogues of products since 'every project is a launch', as reported by the managing director during one of the interviews. The dynamic environment pushes them to undertake ongoing research, and requires high levels of flexibility and technology.

This company was selected because it is a novice to the idea of customer-centricity with no previous knowledge on service design. However, they are driven to start offering services following a client's request to formalize a maintenance contract. Focussing on happiness of the customers and employees are already perceived as key drivers for the performance of the company.

A key finding from the interviews (as perceived from the MD) is the lack of informal communication and the inability of engineers to empathize with customers and operators due to their functional requirement viewpoints. This has a huge impact on the hiring process of new staff to manage company's growth as planned. During the interviews the MD indicated an increasing awareness of the organisational and system requirements for servitization. He perceived that his firm had the capabilities but lacked the infrastructure to implement services.

Below are the results from the application of the readiness framework. Compared to company A and B, company C performed lower scores for the fact that is now starting to consider services. Although it performed well in the past and gained experience for the one-off machines that produces, a poor level of internal communication and flow of information hinder the service implementation further.

Figure 5 Radar diagram of Company C



Discussion

In the three cases, the companies engaged with servitization in different ways, driven by different motivations and resulting in different impacts. Company A claims that service design tools have been used for improving the business focus, to make better decisions and to manage the company internally. Although service design tools had an impact on product development, they are still not explicitly considered for new service development or integrated in the current product development process. Whereas, in Company B, there was an understanding of the commercial benefits. They had started to consider the shift from product to services as an extension of their business formulae. In Company C, despite a lack of prior formal knowledge in service design, the managing director started focussing on soft aspects to measure performance beyond profitability. This included perceptions of customer satisfaction beyond standard KPIs. Therefore, he is currently finding information on how the customer-oriented approach can benefit his business. Further, he has been explicitly asked to offer maintenance contracts on their machines by a former client. According to the results, Company A offers product-oriented services, as 99% of the turnover came from the purchase of their systems; while Company B creates result-oriented PSS since their products demonstrate the amount of water treated. In both cases technology and digital tools informed the way the offering is created and the way the firms are building a dialogue with customers.

At board level, staff across the three firms point out the importance of communication; the flow of information within the company; and, the involvement of staff beyond the development team for the collection of insights. At an operational level, in Company A, the operations director and his department feel they are a conduit between the customers outside and the engineers inside. Information from sales representatives, contractors, and customers create awareness of customer frustrations early in the process. This information leads to improved service offerings. Company A has an on going refinement process of tracking and measuring performance based on individual daily targets. In Companies B and C, the employees interviewed described a sense of belonging to the current firm due to the diverse tasks and experiences they are offered. The managing director of Company B and C is a source of ideas and taken as an example presenting a sense of progression. In Company C, the workshop supervisor is aware that there

is room for improvement in communication in his department and looks for higher levels of involvement of the workshop at the outset of the design process.

The servitisation literature shows on one end awareness of the potential of services and on the other end describes many failures in implementation. For manufacturing companies willing to explore service orientation, Löfberg (2014) states a need for consistency between the three dimensions of business logics: value perspective, service business strategy, and service offering. Saara Brax (2005) notes that becoming a service-focused business by broadening the total offering with services is challenging, because services are in conflict with the transaction orientation. Hence, becoming a provider of industrial services is not just a matter of the offering; the whole organization needs to re-focus its attention. Where firms lack understanding of the potential of developing service and the steps to take, it is unlikely for them to achieve success (de Brentani, 1991, 1995; Gebauer et al., 2005). Ates and Bititci (2011) point out that for building resilient SMEs the key enabler is change management process capability because, based on their findings, those firms seem to focus mainly on operational, hard and internal aspects of change management with a short-term, reactive behaviour, whilst neglecting strategic, long-term and soft requirements of organisational change process. However, change and culture management seem to be viewed separately in SMEs. Since culture management is driven by rewarding employees and internal communication activities. Change management practices mainly focus on implementation. Planning, preparation and embedding change seem to be less emphasised. Change management practices are primarily internally focused as evidenced by the limited relationship management with external stakeholders such as customers, suppliers and competitors. Little attention appears to be paid to communicating with customers, competitors and suppliers in managing change and culture. The conceptual framework presented in this paper is intended to assess readiness as preparation for change. As the company faces servitization, communication and external engagement start to become more central. The different shapes resulted from the readiness framework deployment attest that each company follow its path and what they are is based on their path-dependency (Eisenhardt & Martin, 2000). The authors, aware that the small sample does not provide information to generalisation and prioritization of the dimensions, gained deep understanding on how the three cases are engaging with servitization. Participating companies found it a "*refreshing exercise*" (cit. Managing Director of Company B) to answers to questions that span from the start of the company, how it was build up (e.g. experience, accumulation of knowledge, successful products/projects), the current configuration of capabilities and the future strategy plan will be build upon.

Conclusions

Building on previous stage of presentation of the research, this paper contributes to share results of the final phase of this research in advancing the understanding of readiness of manufacturing companies in undertaking servitization. In this study readiness has been framed in terms of/comprises the absorption notions of design and service from product-oriented firms willing to develop and offers/formalize services to their integrated offerings and how they are required to embrace change. The application of the readiness framework represents an attempt to bridge multiple perspectives involved in servitization, and, the practice of service design. It is not simply to develop new services, but to help manufacturing companies to frame new solutions. The comparison between the deployment of design within

firms and how services require organisational change and alignment between board strategy and operations represented the starting point of this research. The framework developed presents a link between such design deployment and readiness for service, allowing companies to self assess across nine dimensions to better understand their readiness for a service design approach to PSS development. Further, the framework can be considered as an initial step in understanding what benefits service design can bring to SMEs. This research has a twofold contribution: on one side designers can use this tool to evaluate how to engage and offer coaching and training to firms; and on the other side, firms have the opportunity to self-assess their business to extend service awareness. The challenge behind the framework is to train non-service designers to implement ideas, starting from a formalisation of the interactions (channels and touchpoints) between manufacturers, customers and stakeholders where services are seen as the glue (Lipparini & Sobrero, 1994) between products and experiences. The framework presented here begins to explore motivations and expectations of servitization; however, there is clearly still much work to be done to understand what benefits service design can bring to SMEs. In assessing readiness of manufacturing companies, further examination is needed regarding: the dependence of the size of the firm; patterns in family-owned business (in large samples); implication of firm's position in the supply chain; the differences from large organisations; the future role of small manufacturing firm; the organic grow and the hiring process within this size of firm; and further implications of servitization of SMEs in manufacturing. Although a generalization and prioritization is not possible and reliable at this stage and further investigation of this topic is necessary, a number of correlations among the dimensions are shown. Further investigation on a larger sample across different industries can put light on the prioritization of the dimensions and the put forward the service design contribute to the servitization literature.

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